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(54) **MULTI-PART WIRED SUBSTRATE, WIRED SUBSTRATE, AND ELECTRONIC DEVICE**

MEHRTEILIGES VERDRAHTETES SUBSTRAT, VERDRAHTETES SUBSTRAT UND  
ELEKTRONISCHE VORRICHTUNG

SUBSTRAT CÂBLÉ EN PLUSIEURS PARTIES, SUBSTRAT CÂBLÉ ET DISPOSITIF  
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(72) Inventor: **SEGAWA, Hiroyuki**

**Kyoto 612-8501 (JP)**

(30) Priority: **02.11.2010 JP 2010246388**

(74) Representative: **Viering, Jentschura & Partner**

**mbB**

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(73) Proprietor: **Kyocera Corporation**

**Kyoto-shi, Kyoto 612-8501 (JP)**

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## Description

### Technical Field

**[0001]** The present invention relates to a many-up wiring substrate in which a plurality of wiring board regions serving as wiring board for mounting electronic components are arranged in a central part of an insulating base substrate in at least one of a vertical direction and a horizontal direction.

### Background Art

**[0002]** In the related art, a wiring board for mounting a semiconductor element such as an imaging element or an electronic component such as a crystal oscillator has a configuration in which wiring conductors made of metalized powder of tungsten, molybdenum, or the like are arranged on a surface of an insulating substrate made of electrical insulating materials such as an aluminum oxide sintered body.

**[0003]** Such a wiring board has decreased in size with demands in recent years for decreasing the thickness and size of an electronic device. Thus, in order to efficiently manufacture a plurality of wiring board, the wiring board is manufactured by dividing a many-up wiring substrate. The many-up wiring substrate has a configuration in which a plurality of wiring board regions serving as wiring boards are formed on an insulating base substrate in a matrix form.

**[0004]** In such a wiring board, a castellation conductor is often formed for connection with an external circuit board. In the related art, the castellation conductor has been formed by forming a through hole in an insulating base substrate for a many-up wiring substrate, arranging wiring conductors on side surfaces of the through holes to form a plating coating on the wiring conductors, and dividing the many-up wiring substrate along an intended cutting line that passes through the through holes in a plan view. Moreover, in order to secure a wide region for mounting electronic components on the wiring board, the castellations are often formed by dividing holes which are open on a main surface side that faces the mounting surface of the wiring board but are not penetrated. However, openings of castellation holes decrease as the size of the wiring board decreases and the number of pins increases in recent years. In the forming of a plating coating on the surfaces of the wiring conductors on the side surfaces of the castellation holes, since the opening of the hole is small, when the wiring conductor is immersed in a plating solution, gas remains inside the hole so that it is difficult for the plating solution to enter into the hole. Moreover, there is another problem in that even when the plating solution enters into the hole, it is difficult for the plating solution outside to circulate inside the hole. Further, when the plating coating is deposited by an electrolytic plating method, hydrogen is generated by electrolysis to produce bubbles, and the bubbles stay inside

the hole so that it is difficult for the plating solution to enter into the hole. Due to this, it is difficult to form the plating coating to a predetermined thickness on the surface of the wiring conductors on the side surfaces of the hole, which causes a problem in bonding with an external circuit board or the like. In regard to such a problem, a technique is disclosed in which a dummy region is provided around an individual wiring board region, a through hole that penetrates from the dummy region side is formed on a bottom part of a castellation hole, and a through hole in which an opening of one main surface of the wiring board positioned close to the external circuit board is smaller than an opening of the other main surface so that the plating solution can easily circulate (for example, see Patent Literature 1).

### Citation List

#### Patent Literature

**[0005]** Patent Literature 1: Japanese Unexamined Patent Publication JP-A 2007-201274

**[0006]** US 2009/001396 A1 discloses that a collective substrate has through-holes, which each have an interior surface including taper surfaces which are tapered as having an opening size progressively decreasing from a main surface and an external connection surface toward a minimum size hole portion (cf. Abstract).

**[0007]** JP 2002 016341 A discloses that a method for producing a joint ceramic wiring board comprises a step for forming a first brake groove communicating with a second major surface side recess by inserting a first groove forming cutter from the first major surface side along the outer circumferential boundary line at each product part, a step for firing a large unfired ceramic sheet to produce a joint ceramic wiring board having a sealing metallize layer formed along the first brake groove wherein the firing shrinkage rate of a metallize paste forming an unfired metallize layer is set higher than that of a ceramic green sheet forming the large unfired ceramic sheet (cf. Abstract).

**[0008]** JP 2006 049551 A discloses that an aggregate substrate is manufactured so that two substrate units of the ceramic substrate are connected and the open side of the open cavity coincides with a separation predetermined line (cf. Abstract). This document further discloses that break grooves are formed each from a first main surface and a second main surface on a pair of wall parts facing across the open cavity, and that a break through hole is formed along the separation predetermined line in a cavity bottom surface (cf. Abstract).

**[0009]** JP 2007 201274 A discloses that a multiple patterning wiring board comprises a mother board which has first and second faces, and on which a plurality of wiring board regions and a dummy region adjoining to the plurality of the wiring board regions are formed; and a notch formed between the first face of the mother board and the inside of the mother board in the plurality of the

wiring board regions (cf. Abstract).

**[0010]** JP 2004 056061 A discloses that a package for image pickup device comprises an insulating body and a translucent lid, wherein the insulating body has a recess on the upper face for mounting the image pickup device, and the translucent lid is bonded to the upper face of the insulating body with a sealing material between so that the recess is covered (cf. Abstract).

#### Summary of Invention

#### Technical Problem

**[0011]** However, with a further decrease in the size of a wiring board in recent years, even when a through hole is formed in a bottom part of a castellation hole, a plating solution does not sufficiently circulate inside the hole. In particular, the thickness of a plating coating deposited on the surface of the castellation conductor at a corner part formed between the bottom part and the side surface of the castellation hole is smaller than the thickness of the plating coating deposited on the surface of the castellation conductor near the opening of the hole. If such a corner part is positioned close to the wiring board region of the castellation hole, when the hole is divided to obtain a castellation notch, the plating coating does not have a sufficient thickness in a corner part of the notch. As described above, if a part that does not have a sufficient thickness is provided in the plating coating deposited on the surface of the castellation conductor, it is difficult to sufficiently bond a brazing material such as solder with the castellation conductor. Thus, the brazing material and the castellation conductor are separated and disconnected, and a problem in bonding with the wiring of the external circuit board occurs.

**[0012]** The invention has been made in view of the problem of the related art, and an object of the invention is to provide a many-up wiring substrate for manufacturing a small wiring board capable of satisfactorily realizing bonding with the wiring of the external circuit board.

#### Solution to Problem

**[0013]** The present invention provides a many-up wiring substrate according to claim 1, a wiring board according to claim 5, and an electronic device according to claim 9. Further embodiments of the present invention are described in the dependent claims.

#### Advantageous Effects of Invention

**[0014]** The many-up wiring substrate according to the invention includes: the insulating base substrate having a plurality of wiring board regions arranged in at least one of a vertical direction and a horizontal direction; a hole disposed in one main surface of the insulating base substrate, and straddling adjacent wiring board regions or straddling the wiring board regions and a dummy re-

gion; a conductor disposed on an inner surface of the hole; and a through hole disposed so as to extend from the inner surface of the hole to the other main surface of the insulating base substrate. Due to such a configuration, since a plating solution in a corner part formed between a side surface and a bottom surface of the hole can easily flow when the many-up wiring substrate is immersed in the plating solution, the plating solution is suppressed from remaining in the hole. Thus, since the plating solution can easily circulate in a part, where it is difficult for the plating solution to circulate, of the corner part formed between the side surface and the bottom surface of the hole so as to be close to the wiring board region, it is possible to deposit a plating coating to a desired thickness on the surface of the conductor that is disposed near the corner part formed between the side surface and the bottom surface of the hole. When such a hole is divided and used as a castellation conductor, it is possible to suppress the castellation conductor from being separated from an external circuit board.

**[0015]** A wiring board according to the invention includes: an insulating substrate; a notch disposed on a side surface of the insulating substrate so as to extend from one main surface of the insulating substrate to half-way in a thickness direction of the insulating substrate; a conductor disposed on an inner surface of the notch; and a through disposed so as to extend from the inner surface of the notch to the other main surface or a side surface of the insulating substrate. Due to such a configuration, the plating solution in the corner part formed between the side surface and the bottom surface of the notch can easily flow when the wiring board is immersed in the plating solution, and the plating solution is suppressed from remaining in the corner part of the notch. Thus, since the plating solution can easily circulate in a part, where it is difficult for the plating solution to circulate, of the corner part formed between the side surface and the bottom surface of the notch so as to be close to the center of the wiring board, it is possible to deposit a plating coating to a desired thickness on the surface of the conductor that is disposed near the corner part formed between the side surface and the bottom surface of the notch.

**[0016]** An electronic device according to the invention includes: the wiring board having the above-described configuration; an electronic component element mounted on the wiring board; and a lid disposed on the wiring board so as to cover the electronic component element. Due to such a configuration, since the plating coating having a desired thickness is deposited on the surface of the conductor, it is possible to increase the strength of the bonding between the electronic device and an external circuit board.

#### Brief Description of Drawings

**[0017]**

Fig. 1(a) is a plan view illustrating an example of an embodiment of a many-up wiring substrate according to the invention, Fig. 1(b) is a cross-sectional view taken along the line A-A of Fig. 1(a), and Fig. 1(c) is an enlarged cross-sectional view of a main part in the section A in Fig. 1(b);

Fig. 2(a) is a plan view illustrating another example of a many-up wiring substrate, Fig. 2(b) is a cross-sectional view taken along the line A-A of Fig. 2(a), and Fig. 2(c) is an enlarged cross-sectional view of a main part in the section A in Fig. 2(b);

Fig. 3(a) is a plan view illustrating another example of an embodiment of a many-up wiring substrate according to the invention, Fig. 3(b) is a cross-sectional view taken along the line A-A of Fig. 3(a), and Fig. 3(c) is an enlarged cross-sectional view of a main part in the section A in Fig. 3(b);

Fig. 4(a) is a plan view illustrating another example of an embodiment of a many-up wiring substrate according to the invention, Fig. 4(b) is a cross-sectional view taken along the line A-A of Fig. 4(a), and Fig. 4(c) is an enlarged cross-sectional view of a main part in the section A in Fig. 4(b);

Fig. 5(a) is a plan view illustrating an example of an embodiment of a wiring board according to the invention, and Fig. 5(b) is a cross-sectional view taken along the line A-A of Fig. 5(a);

Fig. 6(a) is a perspective view illustrating an example of an embodiment of a wiring board according to the invention, and Fig. 6(b) is a perspective view of a lower surface illustrated in Fig. 6(a);

Fig. 7(a) is an enlarged perspective view of a main part of the section A in Fig. 5(a), and Fig. 7(b) is a perspective view of a lower surface illustrated in Fig. 7(a); and

Fig. 8(a) is a plan view illustrating an example of an embodiment of an imaging apparatus according to the invention, and Fig. 8(b) is a cross-sectional view taken along the line A-A.

#### Description of Embodiments

**[0018]** A many-up wiring substrate according to the invention will be described with reference to the accompanying drawings. In Figs. 1 to 4, reference numeral 1 denotes an insulating base substrate, reference numeral 1a denotes a wiring board region, reference numeral 1b denotes a dummy region, reference numeral 1c denotes a hole, reference numeral 1d denotes a through hole, reference numeral 2 denotes an intended cutting line, reference numeral 3 denotes a conductor, reference numeral 4 denotes a recess part, reference numeral 5 denotes an insulating substrate, reference numeral 5a denotes a notch, reference numeral 6 denotes a lid, reference numeral 6a denotes a transparent part, reference numeral 6b denotes a side wall, reference numeral 7 denotes an electronic component element (imaging device), and reference numeral 8 denotes a bonding ma-

terial.

**[0019]** As in the examples illustrated in Figs. 1 to 4, a many-up wiring substrate according to the invention includes the insulating base substrate 1 having a plurality of wiring board regions 1a arranged in at least one of a vertical direction and a horizontal direction, the hole 1c disposed in one main surface of the insulating base substrate 1, and straddling adjacent wiring board regions 1a or straddling the wiring board regions 1a and the dummy region 1b, the conductor 3 disposed on an inner surface of the hole 1c, and the through hole 1d disposed so as to extend from the inner surface of the hole 1c to the other main surface of the insulating base substrate 1. Due to such a configuration, since a plating solution in a corner part formed between a side surface and a bottom surface of the hole 1c can easily flow when the many-up wiring substrate is immersed in the plating solution, the plating solution is suppressed from remaining in the hole 1c. Thus, since the plating solution can easily circulate in a part, where it is difficult for the plating solution to circulate, of the corner part formed between the side surface and the bottom surface of the hole 1c so as to be close to the wiring board region 1a, it is possible to deposit a plating coating to a desired thickness on the surface of the conductor 3 that is disposed near the corner part formed between the side surface and the bottom surface of the hole 1c. When such a hole is divided and used as a castellation conductor, it is possible to suppress the castellation conductor from being separated from an external circuit board.

**[0020]** The through hole 1d disposed so as to extend from the inner surface of the hole 1c to the other main surface of the insulating base substrate 1, corresponds to the structure of the through hole 1d that is disposed so as to extend from at least one of the side surface or the bottom surface of the hole 1c to the other main surface of the insulating base substrate 1.

**[0021]** Moreover, as in the examples illustrated in Figs. 1 to 4, in the configuration of the many-up wiring substrate of the invention, when the opening of the through hole 1d is disposed in the inner surface of the hole 1c so as to be close to the center of each of the wiring board regions 1a, a plating solution in the corner part formed between the side surface and the bottom surface of the hole 1c so as to be close to the center of each of the wiring board regions 1a can easily flow when the many-up wiring substrate is immersed in the plating solution. Therefore, it is effective in forming the plating coating near the corner part formed between the side surface and the bottom surface of the hole 1c so as to be close to the center of each of the wiring board region 1a to a desired thickness.

**[0022]** In the above-described configuration, when the opening of the through hole 1d is disposed in the side surface of the hole 1c, it is preferable that the opening of the through hole 1d is disposed in the side surface of the hole 1c closer to the bottom surface since the plating solution in the corner part formed between the side surface and the bottom surface of the hole 1c can flow more

easily.

**[0023]** Moreover, as in the examples illustrated in Figs. 3 and 4, in the configuration of the many-up wiring substrate of the invention, the recess part 4 that overlaps a part of the hole 1c in a plan view is provided in the other main surface of the insulating base substrate 1, and an opening of the through hole 1d on a side of the other main surface is disposed in the bottom surface of the recess part 4. Thus, since the depth of the through hole 1d can be decreased, the plating solution can easily flow inside the through hole 1d. Therefore, it is possible to suppress the plating solution from remaining in the hole 1c more effectively and to deposit the plating coating uniformly on the surface of the conductor 3.

**[0024]** It is sufficient that a plurality of wiring board regions 1a are arranged in at least one of the vertical direction and the horizontal direction. In the examples illustrated in Figs. 1 to 4, although five rows are arranged in the vertical direction and four rows of wiring board regions 1a are arranged in the horizontal direction, a larger number of rows of wiring board regions 1a may be arranged. For example, six rows of wiring board regions 1a may be arranged in the vertical direction, and nine rows of wiring board regions 1a may be arranged in the horizontal direction so that fifty four wiring board regions 1a may be arranged in total. Moreover, the many-up wiring substrate of the invention may be a many-up wiring substrate in which one row of wiring board regions 1a is arranged in the vertical direction and four rows of wiring board regions 1a are arranged in the horizontal direction so that four wiring board regions 1a are arranged in total. Further, the many-up wiring substrate of the invention may be a many-up wiring substrate in which three rows of wiring board regions 1a are arranged in the vertical direction and one row of wiring board regions 1a is arranged in the horizontal direction so that three wiring board regions 1a are arranged in total. The arrangement of the wiring board regions 1a is set according to the size of the insulating base substrate 1 and the wiring board region 1a, the arrangement of the electronic components and the conductors 3 mounted on the wiring board region 1a, and the like. In the example illustrated in Fig. 4, a third through hole 1e is formed in the bottom surface of the recess part 4.

**[0025]** The insulating base substrate 1 is made of insulating materials such as ceramics or resin. When ceramics are used, examples thereof include an aluminum oxide sintered body (alumina ceramics), an aluminum nitride sintered body, a mullite sintered body, and a glass ceramics sintered body. When resin is used, examples thereof include an epoxy resin, a polyimide resin, an acrylic resin, a phenol resin, a polyester resin, and a fluorine resin including a tetrafluoroethylene resin. Moreover, like a glass epoxy resin, a material that is impregnated into a base material made of glass fiber may also be used.

**[0026]** When the insulating base substrate 1 is made of an aluminum oxide sintered body, for example, the insulating base substrate 1 is produced as follows. An

appropriate organic solvent and an appropriate dissolvent are added to and mixed with raw material powder such as alumina ( $\text{Al}_2\text{O}_3$ ), silica ( $\text{SiO}_2$ ), calcium oxide (CaO), and magnesia (MgO) to obtain a slurry, the slurry is processed into a sheet form using a known doctor blade method, a calendar roll method, or the like to obtain a ceramic green sheet, the ceramic green sheet is then subjected to appropriate punching processing, and if necessary, a plurality of sheets are stacked and the resultant is fired at high temperature (approximately 1500 to 1800°C) to obtain the insulating base substrate 1.

**[0027]** When the insulating base substrate 1 is made of resin, for example, the insulating base substrate 1 can be molded by transfer molding, injection molding, or the like using a mold capable of molding the insulating base substrate into a predetermined shape of the many-up wiring substrate. Moreover, like a glass epoxy resin, a material that is impregnated into a base material made of glass fiber may also be used. In this case, the insulating base substrate 1 can be formed by impregnating a precursor epoxy resin into a base material made of glass fiber and thermally curing the precursor epoxy resin at a predetermined temperature.

**[0028]** As in the examples illustrated in Figs. 1 to 4, the hole 1c is disposed so as to extend straddling adjacent wiring board regions 1a or straddling the wiring board regions 1a and the dummy region 1b and is provided to be open in one main surface of the insulating base substrate 1. Such a hole 1c serves as the castellation notch 5a when the many-up wiring substrate is divided to obtain the wiring board. Such a hole 1c is a bottomed hole that extends halfway in the thickness direction of the insulating base substrate 1, and is formed in a polygonal shape such as a rectangle or a hexagon or a circular shape such as a circle or an ellipse in a plan view.

**[0029]** When the insulating base substrate 1 is made of ceramics, the insulating base substrate 1 having the hole 1c can be produced by stacking a first ceramic green sheet in which a first through hole for the hole 1c is disposed at a desired position by punching and performing laser processing using a mold on a second ceramic green sheet and then firing them. Moreover, the insulating base substrate 1 having the hole 1c may also be produced by subjecting a ceramic green sheet or a ceramic sintered body obtained by firing a ceramic green sheet to mechanical processing such as drilling or laser processing with lower power than that when forming the through hole. When the insulating base substrate 1 is made of resin, the insulating base substrate 1 having the hole 1c may be produced using an appropriate mold or may be produced by performing mechanical processing such as drilling or laser processing after forming the insulating base substrate 1.

**[0030]** As in the examples illustrated in Figs. 1 to 4, it is preferable that the through hole 1d is disposed so as to extend from a corner part formed between the side surface and the bottom surface of the hole 1c so as to be close to the center of each of the wiring board region

1a to the other main surface of the insulating base substrate 1. In this case, it is effective in making the plating solution in the corner part formed between the side surface and the bottom surface of the hole 1c closer to the center of each of the wiring board regions 1a flow easily when the insulating base substrate 1 is immersed in the plating solution.

**[0031]** As in the examples illustrated in Figs. 2 to 4, when the through hole 1d is formed linearly in the thickness direction of the insulating base substrate 1, since the through hole 1d has a linear form, it is effective in making the plating solution pass easily through the through hole 1d and making it difficult for the plating solution to remain in the hole 1c when the insulating base substrate 1 is immersed in the plating solution as compared to when the through hole 1d is bent.

**[0032]** Moreover, as in the examples illustrated in Figs. 1 to 4, when the opening of the through hole 1d is formed on the inner surface of the hole 1c so as to be along the corner formed between the side surface and the bottom surface of the hole 1c, since the plating solution can easily flow in the corner part formed between the side surface and the bottom surface, it is effectively to make it difficult for the plating solution to remain in the hole 1c.

**[0033]** As in the examples illustrated in Figs. 1, 2, and 4, when such a through hole 1d is disposed so as to face two corner parts on the left and right sides of the rectangular hole 1c, the plating solution flows into the left and right through holes 1d. Thus, it is possible to suppress the plating solution from remaining in the corner part of the hole 1c more effectively.

**[0034]** In particular, when the through hole 1d is disposed on both end parts in the longitudinal direction of the long sides of the rectangular hole 1c, the plating solution also flows toward the through hole 1d, and it is effective in forming the plating coating also in a corner part where the through hole 1d is not disposed. Moreover, the through hole 1d is disposed over the entire end part of the rectangular hole 1c in a plan view. Further, as in the examples illustrated in Figs. 2 to 4, when the through hole 1d is disposed on the bottom part of the hole 1c, the through hole 1d is disposed over the entire end part of the bottom part of the hole 1c in a plan view.

**[0035]** Moreover, when the through hole 1d is formed in the rectangular hole 1c, and the through hole 1d is formed in a C-shape that extends along the three sides of the bottom surface, it is effective in decreasing the corner part where the plating solution is likely to remain and increasing the range in which the plating coating is formed to have a desired thickness.

**[0036]** Moreover, as in the example illustrated in Fig. 3, when the hole 1c and the through hole 1d are formed in a circular form in plan view, the hole 1c does not have a corner part in a plan view, and it is effective in making it difficult for the plating solution to remain in the corner part when the plating solution flows from the through hole 1d.

**[0037]** The through hole 1d described above can be

formed by the same method as that when forming the hole 1c. That is, when the insulating base substrate 1 is made of ceramics, the insulating base substrate 1 having the through hole 1d can be produced by stacking a second ceramic green sheet in which a second through hole for the through hole 1d smaller than the first through hole for the hole 1c is disposed on the first ceramic green sheet having the first through hole so that the second through hole is positioned in the first through hole in a plan view and then firing them. Moreover, the through hole 1d may be formed by subjecting the insulating base substrate 1 having the hole 1c to mechanical processing or laser processing. When it is difficult for the through hole 1d to have predetermined dimensions due to misalignment of a plurality of ceramic green sheets, it is preferable to form the through hole 1d after forming the hole 1c.

**[0038]** As in the examples illustrated in Figs. 1, 3, and 4, the recess part 4 may be disposed in a main surface of the insulating base substrate 1 opposite the main surface where the hole 1c is disposed. When the recess part 4 is disposed so as to overlap the hole 1c in a plan view, it is preferable that the through hole 1d is disposed between the corner part formed between the side surface and the bottom surface of the hole 1c, and the bottom surface of the recess part 4. Since the length of the through hole 1d can be decreased, it is further effective in making the plating solution pass easily through the through hole 1d and making the plating solution difficult to remain in the hole 1c.

**[0039]** Moreover, when the recess part 4 is disposed so as to overlap the hole 1c in a plan view, it is preferable that the through hole 1d is open in the bottom surface of the hole 1c closer to the center of each of the wiring board region 1a. Due to such a configuration, it is effective in forming the penetration hole 1d of the through hole 1d in a linear form so as to be open in the bottom surface or the side surface of the recess part 4.

**[0040]** As in the example illustrated in Fig. 2, when the through hole 1d is bent, even if a bonding material such as resin for fixing an electronic component flows into the through hole 1d when the electronic component is mounted in the recess part 4, since the bonding material is likely to remain in the through hole 1d, it is possible to suppress the bonding material from flowing up to the hole 1c.

**[0041]** As in the example of Fig. 3, the hole 1c and the recess part 4 are disposed so as to overlap each other in a plan view. In such a case, it is preferable that the through hole 1d has a linear form between the corner part of the hole 1c and the bottom surface of the recess part 4 so as to penetrate the overlapping part of the hole 1c and the recess part 4 in a plan view. Since the through hole 1d has a linear form, it is effective in suppressing the plating solution from remaining in the hole 1c. Further, as in the example illustrated in Fig. 4, when the bottom part of the hole 1c and the bottom part of the recess part 4 are at the same height in a cross-sectional view, or when the hole 1c and the recess part 4 overlap each

other in a cross-sectional view, it is particularly preferable since the length in the thickness direction of the through hole 1d can be decreased.

**[0042]** Moreover, as in the example illustrated in Fig. 1, when the opening of the through hole 1d is disposed in the side surface of the hole 1c of each of the wiring board region 1a so as to be in contact with the bottom surface of the hole 1c, since it is not necessary to form a bent part unlike in a case where the opening of the through hole 1d is disposed in the side surface of the hole 1c so as to be close to one main surface of the insulating base substrate 1, it is effective in forming the through hole 1d in a linear form.

**[0043]** When the insulating base substrate 1 is made of ceramics, the conductor 3 is made of metalized powder of tungsten (W), molybdenum (Mo), manganese (Mn), silver (Ag), copper (Cu), or the like and is formed at a predetermined position of the insulating base substrate 1 by printing a metalized paste for the conductor 3 on a ceramic green sheet for the insulating base substrate 1 in a predetermined shape by screen printing or the like and co-firing the metalized paste together with the ceramic green sheet for the insulating base substrate 1.

**[0044]** The conductor 3 includes a wiring conductor that is disposed on the surface of the insulating base substrate 1 and between insulating layers and a penetrating conductor that penetrates through the insulating layers and electrically connects upper and lower conductors 3. When the insulating base substrate 1 is made of ceramics, the wiring conductor disposed on the surface or between insulating layers is formed by printing and applying the metalized paste for the conductor 3 on the ceramic green sheet for the insulating base substrate 1 using printing means such as screen printing and firing the metalized paste together with a molded body for the insulating base substrate 1. Moreover, the penetrating conductor is formed by forming a through hole for the penetrating conductor in the ceramic green sheet for the insulating base substrate 1 according to a processing method such as punching processing using a mold or a punch or laser processing before printing and application of the metalized paste for forming the conductor 3, filling the metalized paste for the penetrating conductor in the through hole by printing means such as screen printing, and firing the metalized paste together with a molded body serving as the insulating base substrate 1. The metalized paste is produced by adding an organic binder and an organic solvent, and if necessary, a dispersant or the like to metal powder of a main component and mixing and kneading the mixture using kneading means such as a ball mill, a triple roll mill or a planetary mixer. Moreover, glass or ceramics powder may be added in compliance with a sintering behavior of the ceramic green sheet and in order to increase the strength of bonding with the insulating base substrate 1 after firing. The viscosity of the metalized paste for the penetrating conductor is adjusted to a viscosity that is ideal for filling and is generally higher than that of the metalized paste for the

conductor 3 by controlling the type of an organic binder and an organic solvent and the added amount thereof. The metalized paste may contain glass and ceramics in order to increase the strength of bonding with the insulating base substrate 1.

**[0045]** Moreover, when the insulating base substrate 1 is made of resin, the conductor 3 is made of metal materials such as copper, gold, aluminum, nickel, chromium, molybdenum, titanium, and alloys thereof. For example, a copper foil processed in the shape of the conductor 3 is transferred onto a resin sheet made of a glass epoxy resin, the resin sheets onto which the copper foil is transferred are stacked and attached by an adhesive. Moreover, among the conductors 3, the penetrating conductor that penetrates in the thickness direction of the resin sheet may be formed by depositing a conductor paste on the side surface of the through hole that is formed in the resin sheet according to printing or plating or may be formed by filling the through hole. Further, the penetrating conductor is formed by integrating a metal foil and a metal pillar by resin molding or depositing the metal foil on the insulating base substrate 1 using sputtering, evaporation, plating, or the like.

**[0046]** As in the examples illustrated in Figs. 1 to 4, the conductor 3 is also deposited and formed on the side surface of the hole 1c, and when the base substrate 1 is divided, the hole 1c is divided to form the notch 5a on which a terminal electrode is deposited, on the side surface of the wiring board to become a so-called castellation conductor. Such a conductor 3 is formed by printing and depositing the metalized paste on the side surface of the hole serving as the hole 1c, of the ceramic green sheet for the insulating base substrate 1 by printing means such as screen printing and firing the metalized paste together with the molded body for the insulating base substrate 1. The metalized paste is used by adjusting the added amount of the organic solvent or the like according to the dimensions of the hole 1c so that the metalized paste has an appropriate viscosity.

**[0047]** The insulating base substrate 1 is divided into individual wiring boards by cutting the insulating base substrate 1 along the intended cutting line 2 using a dicing blade, a laser cutter, or the like. Moreover, a dividing groove may be formed along the intended cutting line 2 of the insulating base substrate 1, and the insulating base substrate 1 having the dividing groove is divided into individual wiring boards along the dividing groove by applying force to an appropriate position of the insulating base substrate 1 so that the insulating base substrate 1 is convex toward one main surface side or the other main surface side. When the insulating base substrate 1 is made of ceramics, the dividing groove can be formed by pressing a cutting blade or a mold against the molded body serving as the insulating base substrate 1 or performing laser processing. Although the vertical cross-sectional shape of the dividing groove may be a V-shape, a U-shape, or a quadrangular shape, it is preferable that the dividing groove has a V-shaped vertical cross-section.

tional shape since stress can easily concentrate on the bottom part of the dividing groove, and the breaking can be performed easily and accurately when the insulating base substrate 1 is bent and broken along the dividing groove.

**[0048]** Although the depth of the dividing groove is appropriately set depending on the material of an insulating substrate, the depth is preferably set to approximately 50% to 70% of the thickness of the insulating base substrate 1. By doing so, there is provided a many-up wiring substrate in which the insulating base substrate 1 is divided satisfactorily but is not accidentally broken.

**[0049]** The opening width of the dividing groove is preferably set to approximately 0.01 to 1.0 mm. By doing so, the insulating base substrate 1 can be satisfactorily divided along the dividing groove, the size of each of the wiring board regions 1a is not decreased due to the influence of the area occupied by the dividing groove, and the wiring board regions 1a and the dummy region 1b are not greatly deformed when the dividing groove is formed.

**[0050]** When the recess part 4 is formed on one main surface of the insulating base substrate 1, and the dividing groove is open in the other main surface, it is preferable that the bottom part of the dividing groove is disposed so that the distance between the bottom part of the dividing groove and the other main surface is smaller than the distance between the bottom part of the dividing groove and the bottom surface of the recess part 4. Moreover, when the dividing groove is open in the other main surface, it is preferable that the bottom part of the dividing groove is disposed so that the distance between the bottom part of the dividing groove and one main surface is smaller than the distance between the bottom part of the dividing groove and the bottom surface of the recess part 4. Moreover, when the dividing groove is formed so as to face both main surfaces, it is preferable that the distance between the bottom parts of the dividing grooves is smaller than the distance between each of the dividing grooves and the bottom surface of the recess part 4. Due to such a configuration, it is effective in suppressing the insulating base substrate 1 from being divided between the bottom part of the dividing groove and the corner part of the bottom surface of the recess part 4.

**[0051]** A metal plating having excellent anti-corrosion properties, such as nickel or gold is deposited on an exposed surface of the conductor 3 to become a connection electrode or an external terminal electrode. In this way, it is possible to effectively suppress corrosion of the conductor 3 and to strengthen the bonding between the conductor 3 and an electronic component, the bonding between the conductor 3 and a bonding wire, and the bonding between the conductor 3 and a wiring conductor of an external circuit board. Moreover, a nickel plating coating having a thickness of approximately 1 to 10  $\mu\text{m}$  and a gold plating coating having a thickness of approximately 0.1 to 3  $\mu\text{m}$  are deposited one after another on the exposed surface of the conductor 3 by electrolytic plating

or electroless plating.

**[0052]** The wiring board of the invention includes the insulating substrate 5, the notch 5a disposed on the side surface of the insulating substrate 5 so as to extend from one main surface of the insulating substrate 5 to halfway in the thickness direction, the conductor 3 disposed on the inner surface of the notch 5a, and the through hole 1d disposed so as to extend from the inner surface of the notch 5a to the other main surface or the side surface of the insulating substrate 5. Due to such a configuration, the plating solution can easily flow in the corner part of the notch 5a near the through hole 1d, and the plating solution is suppressed from remaining in the corner part of the notch 5a. Thus, the plating solution can easily circulate in the corner part formed between the side surface and the bottom surface of the notch 5a so as to be close to the center of the wiring board, and the plating coating can be deposited on the surface of the conductor 3 to a desired thickness near the through hole 1d among the conductors 3 disposed on the side surface of the notch 5a.

**[0053]** Moreover, in the configuration of the wiring board of the invention, the opening of the through hole 1d of the notch 5a is disposed in the inner surface of the notch 5a so as to be close to the center of the wiring board, the plating solution in the corner part formed between the side surface and the bottom surface of the notch 5a so as to be close to the center of the wiring board can easily flow when the wiring board is immersed in the plating solution. Therefore, it is effective in forming the plating coating near the corner part formed between the side surface and the bottom surface of the notch 5a near the center of the wiring board to a desired thickness.

**[0054]** Moreover, in the configuration of the wiring board of the invention, when the through hole 1d has a linear form in the thickness direction of the insulating substrate 5, the plating solution can easily pass through the through hole 1d and it is difficult for the plating solution to remain in the notch 5a when the insulating substrate 5 is immersed in the plating solution as compared to when the through hole 1d is bent. Thus, it is effective in forming the plating coating to a uniform thickness.

**[0055]** Moreover, in the configuration of the wiring board of the invention, when the opening of the through hole 1d is disposed in the inner surface of the notch 5a so as to be along the corner between the side surface and the bottom surface of the notch 5a, since the plating solution can easily flow in the corner part formed between the side surface and the bottom surface, it is effective in making the plating solution difficult to remain in the notch 5a.

**[0056]** Such a wiring board of the invention can be produced by dividing the same many-up wiring substrate as the examples illustrated in Figs. 1 to 4, for example.

**[0057]** In particular, as in the examples of Figs. 5 to 7, it is preferable that the through hole 1d has a linear form so as to extend from a central side of the bottom surface of the notch 5a to the bottom surface of the recess part

4 that is formed on the other main surface of the insulating substrate 5. With such a configuration, since it is possible to decrease the length of the through hole 1d, it is effective in making the plating solution flow easily.

**[0058]** Moreover, the through hole 1d may be disposed so as to extend from at least one of the bottom surface of the notch 5a so as to be close to the center of the insulating substrate 5 and the bottom surface of the side surface so as to be close to the center of the insulating substrate 5 to the side surface of the recess part 4 or the side surface of the insulating substrate 5. When the opening of the through hole 1d is disposed in the side surface of the recess part 4, if the through hole 1d is bent in the insulating substrate 5, it is effective in suppressing a brazing material from entering into the recess part 4 when a brazing material such as solder is filled in the notch 5a. Moreover, when the opening of the through hole 1d is disposed in the side surface of the insulating substrate 5, since a hole connected to the outside is not disposed in the other main surface, it is effective in increasing airtightness when an electronic component element is mounted on the other main surface and is sealed using a cap-shaped lid 6 or the like.

**[0059]** Moreover, the conductor 3 may be formed on the inner surface of the through hole 1d. In such a case, when a brazing material such as solder is filled in the hole 1c, the brazing material can also be filled in the through hole 1d. In this way, when a brazing material is filled in the through hole 1d, it is effective in increasing the strength of the bonding between the brazing material and the hole 1c.

**[0060]** As in the example illustrated in Fig. 8, since the electronic device of the invention includes the wiring board, the electronic component element 7 mounted on the wiring board, and the lid 6 disposed on the wiring board so as to cover the electronic component element 7, the plating coating having a desired thickness is deposited on the surface of the conductor 3. Thus, it is possible to increase the strength of the bonding between the electronic device and an external circuit board.

**[0061]** In the above configuration of the electronic device of the invention, when the bonding material 8, which bonds the wiring board and the lid 6, is spreaded from a position between the wiring board and the lid 6 to the through hole 1d, since the bonding material 8 is filled in the notch 5a, it is effective in increasing the strength of the bonding between the wiring board and the lid 6.

**[0062]** When the electronic component is a flip chip-type semiconductor device, for example, the mounting of the electronic component is performed by electrically and mechanically connecting the electrodes of the semiconductor device and the conductors 3 via solder bumps or gold bumps, or a bonding material such as a conductive resin (an anisotropic conductive resin or the like). Moreover, after the electronic component is bonded to an electronic component mounting region by a bonding material, an underfill may be injected between the electronic component and the wiring board. Alternatively,

when the electronic component is a wire bonding-type semiconductor device, for example, the electronic component is fixed to an electronic component mounting region by a bonding material, and then, the electrodes of the semiconductor device and the conductors 3 are electrically connected via bonding wires. Further, when the electronic component is a piezoelectric device such as a crystal vibrator, for example, fixing of the piezoelectric device and electrical connection between the electrodes of the piezoelectric device and the conductors 3 is realized by a bonding material such as a conductive resin. Further, a second electronic component such as a resistor element or a capacitor element may be mounted around the electronic component as necessary.

**[0063]** The electronic device of the invention is an imaging apparatus in which the imaging device 7 is mounted as the electronic component element 7, for example. As in the example illustrated in Fig. 8, the imaging apparatus includes the imaging device 7 mounted on the wiring board and the cap-shaped lid 6 which is disposed on the wiring board so as to cover the imaging device 7 and which has the transparent part 6a on an upper surface thereof, in which the side wall 6b of the lid 6 is disposed so as to overlap the notch 5a in a plan view, and the wiring board and the lid 6 are bonded together. Due to such a configuration, since the bonding material 8 which bonds the wiring board and the lid 6 is filled in the through hole 1d of the wiring board, it is possible to increase the strength of the bonding between the wiring board and the lid 6. In the example illustrated in Fig. 8, the wiring board has a configuration in which the recess part 4 is disposed in the other main surface of the insulating substrate 5, and a third through hole 1e is disposed in the bottom surface of the recess part 4. Moreover, the imaging device 7 has a configuration in which a light receiving part is disposed in the third through hole 1e so as to face the transparent part 6a and is mounted in the recess part 4 in a plan view.

**[0064]** For example, in the many-up wiring substrate of the examples illustrated in Figs. 1 to 4, although an example in which the wiring board regions 1a are arranged to be adjacent to each other has been described, the dummy region 1b may be arranged around each of the wiring board regions 1a. In such a case, it is preferable that the hole 1c is disposed so as to extend straddling the wiring board region 1a and the dummy region 1b around the wiring board region 1a, and the through hole 1d is disposed in the wiring board region 1a and the dummy region 1b. By doing so, it is made difficult for the plating solution is to remain in the hole 1c. Such a dummy region is formed when an asymmetrical notch is formed in the wiring board region 1a. In such a case, it is preferable that the through hole 1d is disposed in both the wiring board region 1a and the dummy region 1b. By doing so, the plating solution can easily flow.

## Reference Signs List

**[0065]**

|                                                  |    |
|--------------------------------------------------|----|
| 1: Insulating base substrate                     | 5  |
| 1a: Wiring board region                          |    |
| 1b: Dummy region                                 |    |
| 1c: Hole                                         |    |
| 1d: Through hole                                 |    |
| 1e: Third through hole                           | 10 |
| 2: Intended cutting line                         |    |
| 3: Conductor                                     |    |
| 4: Recess part                                   |    |
| 5: Insulating substrate                          |    |
| 5a: Notch                                        | 15 |
| 6: Lid                                           |    |
| 6a: Transparent part                             |    |
| 6b: Side wall                                    |    |
| 7: Electronic component element (imaging device) |    |
| 8: Bonding material                              | 20 |

**Claims**

1. A many-up wiring substrate for manufacturing a plurality of wiring boards by being divided into the plurality of wiring boards, comprising:
  - an insulating base substrate (1) having a plurality of wiring board regions (1a) arranged in at least one of a vertical direction and a horizontal direction in a plan view of the insulating base substrate (1);
  - a hole (1c) disposed in one main surface of the insulating base substrate (1), and straddling adjacent wiring board regions (1a) of the plurality of wiring board regions (1a) or straddling the wiring board region (1a) and a dummy region (1b);
  - a conductor (3) disposed on an inner surface of the hole (1c); and
  - a through hole (1d) disposed so as to extend from the inner surface of the hole (1c) disposed in the wiring board region (1a) to the other main surface of the insulating base substrate (1), wherein a recess part (4) for mounting a component (7), the recess part (4) overlapping a part of the hole (1c) in a plan view, is disposed in the other main surface of the insulating base substrate (1) within a wiring board region (1a), and an opening on a side of the other main surface of the through hole (1d) is disposed in a bottom surface of the recess part (4).
2. The many-up wiring substrate according to claim 1, wherein an opening of the through hole (1d) is disposed in the inner surface of the hole (1c) so as to be close to a center of the wiring board region (1a).
3. The many-up wiring substrate according to claim 1, wherein the through hole (1d) has a straight linear form in a thickness direction of the insulating base substrate (1).
4. The many-up wiring substrate according to claim 1, wherein an opening of the through hole (1d) is disposed in the inner surface of the hole (1c) so as to be along a corner disposed between a side surface and a bottom surface of the inner surface of the hole (1c).
5. A wiring board, comprising:
  - an insulating substrate (5);
  - a notch (5a) disposed on a side surface of the insulating substrate (5) so as to extend from one main surface of the insulating substrate (5) to halfway in a thickness direction of the insulating substrate (5);
  - a conductor (3) disposed on an inner surface of the notch; and
  - a through hole (1d) disposed so as to extend from the inner surface of the notch to the other main surface, wherein a recess part (4) for mounting a component (7), the recess part (4) overlapping a part of the notch (5a) in a plan, view is disposed in the other main surface of the insulating substrate (1), and an opening on a side of the other main surface of the through hole (1d) is disposed in a bottom surface of the recess part (4).
6. The wiring board according to claim 5, wherein an opening of the through hole (1d) is disposed in the inner surface of the notch (5a) so as to be close to a center of the insulating substrate (5).
7. The wiring board according to claim 5, wherein the through hole (1d) has a straight linear form in the thickness direction of the insulating substrate (1).
8. The wiring board according to claim 5, wherein an opening of the through hole (1d) is disposed in the inner surface of the notch (5a) so as to be along a corner disposed between a side surface and a bottom surface of the inner surface of the notch (5a).
9. An electronic device, comprising:
  - the wiring board according to claim 5;
  - an electronic component element (7) mounted on the wiring board in the recess part (4); and
  - a lid (6) disposed on the wiring board so as to cover the electronic component element.
10. The electronic device according to claim 9, wherein a bonding member (8), which bonds the wiring board

and the lid (6), is disposed from a position between the wiring board and the lid (6) to the through hole (1d).

## Patentansprüche

1. Ein Mehrfachverdrahtungssubstrat zum Herstellen einer Mehrzahl von Verdrahtungsplatten durch Aufteilen in die Mehrzahl von Verdrahtungsplatten, aufweisend:

ein Isolierbasissubstrat (1), das eine Mehrzahl von Verdrahtungsplattenbereichen (1a) aufweist, die in einer Draufsicht auf das Isolierbasissubstrat (1) in mindestens einer von einer vertikalen Richtung und einer horizontalen Richtung angeordnet sind,  
ein Loch (1c), das in einer Hauptfläche des Isolierbasissubstrats (1) angeordnet ist und sich über benachbarte Verdrahtungsplattenbereiche (1a) der Mehrzahl von Verdrahtungsplattenbereichen (1a) erstreckt oder über den Verdrahtungsplattenbereich (1a) und einen Dummy-Bereich (1b) erstreckt,  
einen Leiter (3), der auf einer Innenfläche des Lochs (1c) angeordnet ist, und  
ein Durchgangsloch (1d), das angeordnet ist, um sich von der Innenfläche des Lochs (1c), das in dem Verdrahtungsplattenbereich (1a) angeordnet ist, zu der anderen Hauptfläche des Isolierbasissubstrats (1) zu erstrecken, wobei ein Aussparungsteil (4) zum Montieren eines Bauteils (7) in der anderen Hauptfläche des Isolierbasissubstrats (1) innerhalb eines Verdrahtungsplattenbereichs (1a) angeordnet ist, wobei der Aussparungsteil (4) einen Teil des Lochs (1c) in einer Draufsicht überlappt, und eine Öffnung des Durchgangslochs (1d) auf einer Seite der anderen Hauptfläche in einer unteren Fläche des Aussparungsteils (4) angeordnet ist.

2. Das Mehrfachverdrahtungssubstrat gemäß Anspruch 1, wobei eine Öffnung des Durchgangslochs (1d) in der Innenfläche des Lochs (1c) angeordnet ist, um nahe bei einer Mitte des Verdrahtungsplattenbereichs (1a) zu sein.
3. Das Mehrfachverdrahtungssubstrat gemäß Anspruch 1, wobei das Durchgangsloch (1d) in einer Dickenrichtung des Isolierbasissubstrats (1) eine gerade lineare Form hat.
4. Das Mehrfachverdrahtungssubstrat gemäß Anspruch 1, wobei eine Öffnung des Durchgangslochs (1d) in der Innenfläche des Lochs (1c) angeordnet ist, um entlang einer Ecke zu sein, die zwischen einer Seitenfläche und einer unteren Fläche der Innenfläche

che des Lochs (1c) angeordnet ist.

5. Eine Verdrahtungsplatte, aufweisend:

ein Isoliersubstrat (5),  
eine Nut (5a), die auf einer Seitenfläche des Isoliersubstrats (5) angeordnet ist, um sich von einer Hauptfläche des Isoliersubstrats (5) teilweise in einer Dickenrichtung des Isoliersubstrats (5) zu erstrecken,  
einen Leiter (3), der auf einer Innenfläche der Nut angeordnet ist, und  
ein Durchgangsloch (1d), das angeordnet ist, um sich von der Innenfläche der Nut zu der anderen Hauptfläche zu erstrecken, wobei ein Aussparungsteil (4) zum Montieren eines Bauteils (7) in der anderen Hauptfläche des Isoliersubstrats (1) angeordnet ist, wobei der Aussparungsteil (4) in einer Draufsicht einen Teil der Nut (5a) überlappt, und eine Öffnung auf einer Seite der anderen Hauptfläche des Durchgangslochs (1d) in einer unteren Fläche des Aussparungsteils (4) angeordnet ist.

6. Die Verdrahtungsplatte gemäß Anspruch 5, wobei eine Öffnung des Durchgangslochs (1d) in der Innenfläche der Nut (5a) angeordnet ist, um nahe bei einer Mitte des Isoliersubstrats (5) zu sein.
7. Die Verdrahtungsplatte gemäß Anspruch 5, wobei das Durchgangsloch (1d) in der Dickenrichtung des Isoliersubstrats (1) eine gerade lineare Form hat.
8. Die Verdrahtungsplatte gemäß Anspruch 5, wobei eine Öffnung des Durchgangslochs (1d) in der Innenfläche der Nut (5a) angeordnet ist, um entlang einer Ecke zu sein, die zwischen einer Seitenfläche und einer unteren Fläche der Innenfläche der Nut (5a) angeordnet ist.
9. Eine elektronische Vorrichtung, aufweisend:

die Verdrahtungsplatte gemäß Anspruch 5,  
ein elektronisches-Bauteil-Element (7), das auf der Verdrahtungsplatte in dem Aussparungsteil (4) montiert ist, und  
eine Abdeckung (6), die auf der Verdrahtungsplatte angeordnet ist, um das elektronische-Bauteil-Element zu bedecken.

10. Die elektronische Vorrichtung gemäß Anspruch 9, wobei ein Verbindungselement (8), welches die Verdrahtungsplatte und die Abdeckung (6) miteinander verbindet, von einer Position aus zwischen der Verdrahtungsplatte und der Abdeckung (6) zu dem Durchgangsloch (1d) angeordnet ist.

## Revendications

1. Un substrat de câblage multiple pour fabriquer une pluralité de plaques de câblage par division en la pluralité de plaques de câblage, comportant :
 

un substrat de base isolant (1) ayant une pluralité de régions de plaque de câblage (1a) agencées dans au moins une parmi une direction verticale et une direction horizontale dans une vue de dessus du substrat de base isolant (1),  
un orifice (1c) disposé dans une surface principale du substrat de base isolant (1) et s'étendant au travers des régions de plaque de câblage (1a) adjacentes de la pluralité de régions de plaque de câblage (1a) ou s'étendant au travers de la région de plaque de câblage (1a) et une région factice (1b),  
un conducteur (3) disposé sur une surface intérieure de l'orifice (1c), et  
un trou traversant (1d) disposé de manière à s'étendre à partir de la surface intérieure de l'orifice (1c) disposé dans la région de plaque de câblage (1a) vers l'autre surface principale du substrat de base isolant (1),  
dans lequel une partie d'évidement (4) pour monter un composant (7) est disposée dans l'autre surface principale du substrat de base isolant (1) au sein d'une région de plaque de câblage (1a), la partie d'évidement (4) chevauchant une partie de l'orifice (1c) dans une vue de dessus, et une ouverture du trou traversant (1d) d'un côté de l'autre surface principale est disposée dans une surface inférieure de la partie d'évidement (4).

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2. Le substrat de câblage multiple selon la revendication 1, dans lequel une ouverture du trou traversant (1d) est disposée dans la surface intérieure de l'orifice (1c) de manière à être proche d'un centre de la région de plaque de câblage (1a).
3. Le substrat de câblage multiple selon la revendication 1, dans lequel le trou traversant (1d) a une forme droite linéaire dans une direction d'épaisseur du substrat de base isolant (1).
4. Le substrat de câblage multiple selon la revendication 1, dans lequel une ouverture du trou traversant (1d) est disposée dans la surface intérieure de l'orifice (1c) de manière à être le long d'un coin disposé entre une surface latérale et une surface inférieure de la surface intérieure de l'orifice (1c).
5. Une plaque de câblage, comportant :
 

un substrat isolant (5),  
une encoche (5a) disposée sur une surface la-

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- térale du substrat isolant (5) de manière à s'étendre à partir d'une surface principale du substrat isolant (5) à mi-chemin dans une direction d'épaisseur du substrat isolant (5),  
un conducteur (3) disposé sur une surface intérieure de l'encoche, et  
un trou traversant (1d) disposé de manière à s'étendre à partir de la surface intérieure de l'encoche vers l'autre surface principale, dans lequel une partie d'évidement (4) pour monter un composant (7) est disposée dans l'autre surface principale du substrat isolant (1), la partie d'évidement (4) chevauchant une partie de l'encoche (5a) dans une vue de dessus, et une ouverture d'un côté de l'autre surface principale du trou traversant (1d) est disposée dans une surface inférieure de la partie d'évidement (4).
6. La plaque de câblage selon la revendication 5, dans laquelle une ouverture du trou traversant (1d) est disposée dans la surface intérieure de l'encoche (5a) de manière à être proche d'un centre du substrat isolant (5).
7. La plaque de câblage selon la revendication 5, dans laquelle le trou traversant (1d) a une forme droite linéaire dans la direction d'épaisseur du substrat isolant (1).
8. La plaque de câblage selon la revendication 5, dans laquelle une ouverture du trou traversant (1d) est disposée dans la surface intérieure de l'encoche (5a) de manière à être le long d'un coin disposé entre une surface latérale et une surface inférieure de la surface intérieure de l'encoche (5a) .
9. Un dispositif électronique, comportant :
 

la plaque de câblage selon la revendication 5,  
un élément de composant électronique (7) monté sur la plaque de câblage dans la partie d'évidement (4), et  
un couvercle (6) disposé sur la plaque de câblage de manière à recouvrir l'élément de composant électronique.

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10. Le dispositif électronique selon la revendication 9, dans lequel un élément de liaison (8) qui relie la plaque de câblage et le couvercle (6) l'un à l'autre est disposé à partir d'une position entre la plaque de câblage et le couvercle (6) vers le trou traversant (1d).

FIG. 1

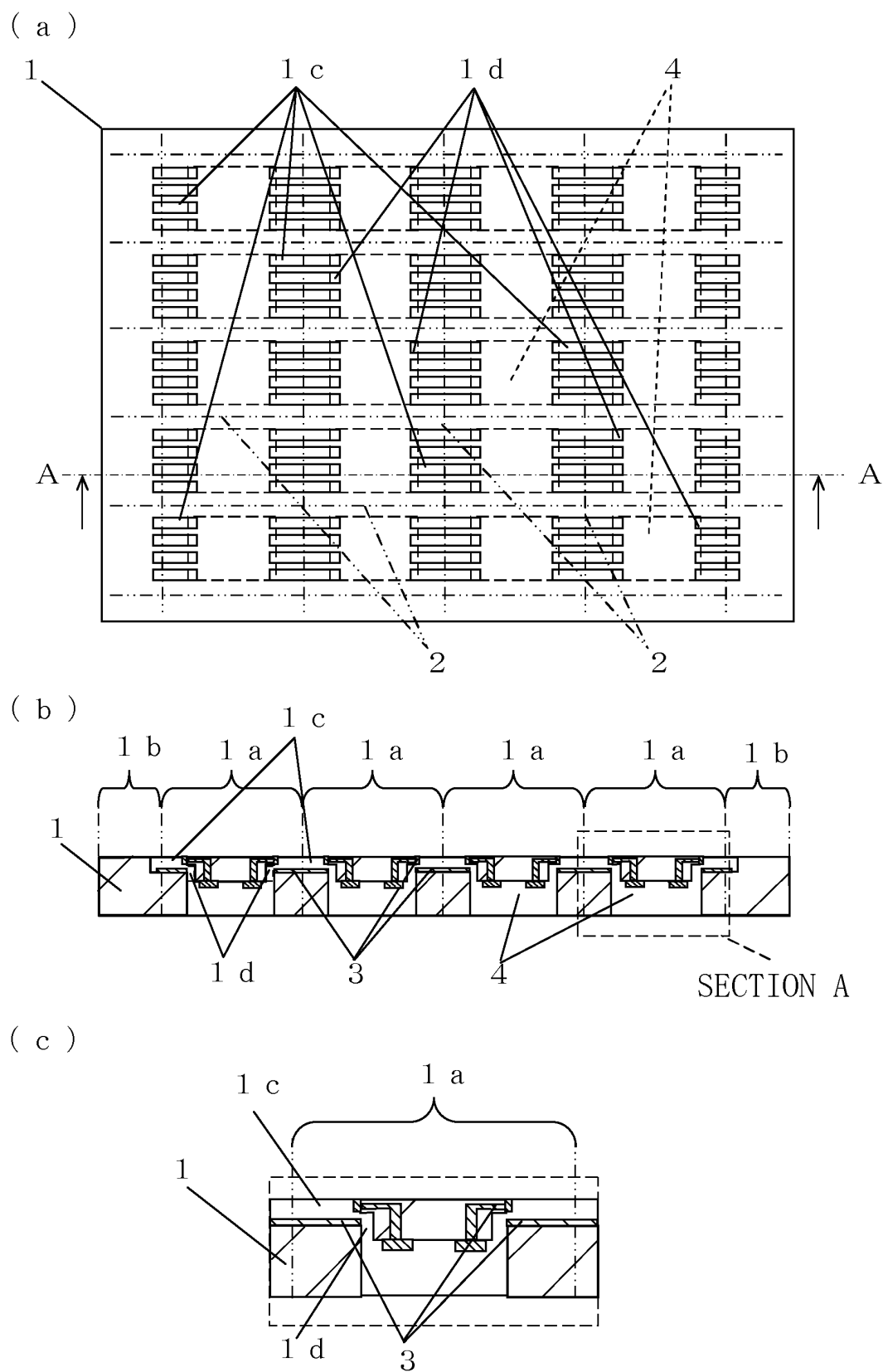


FIG. 2

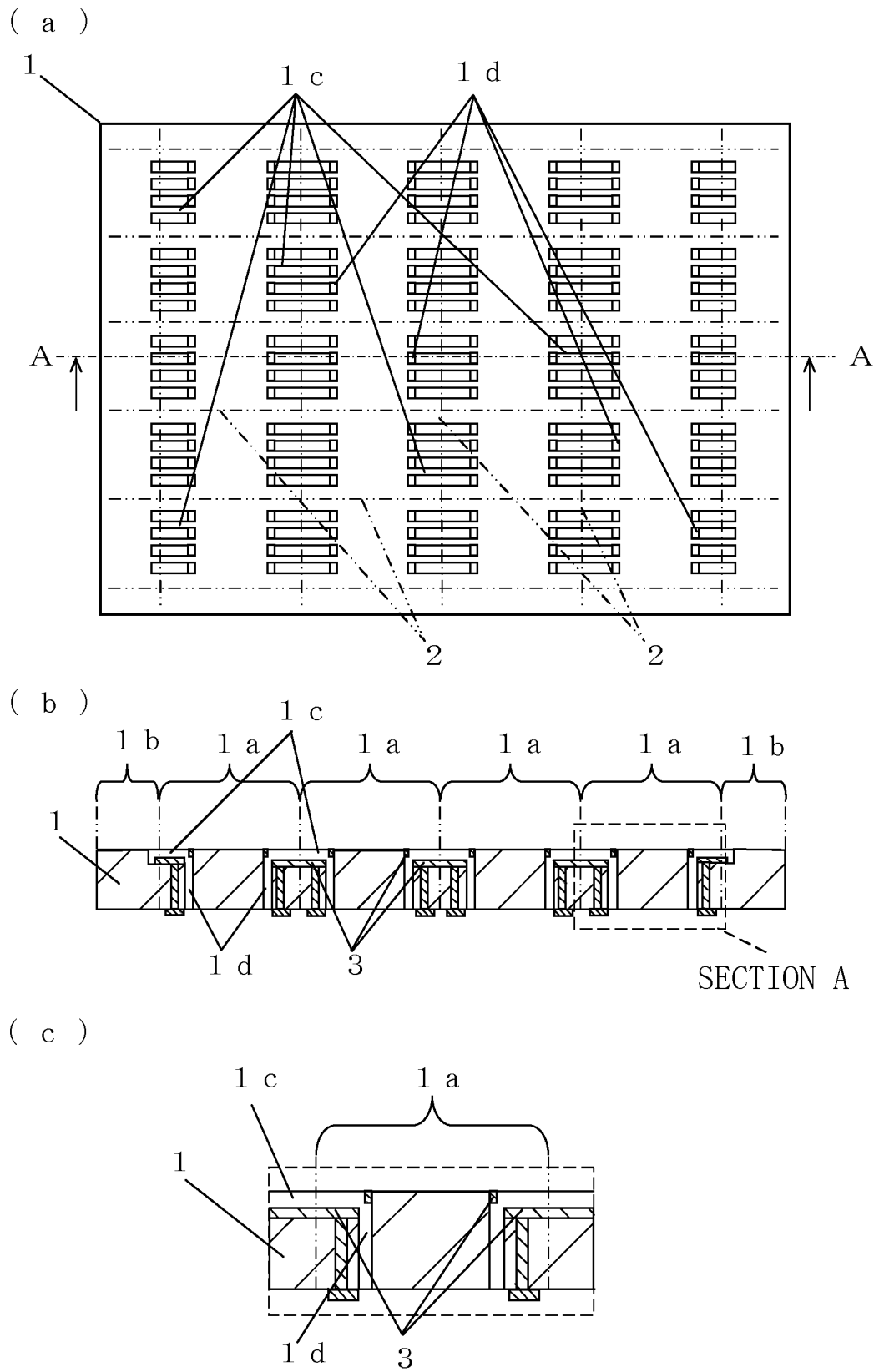
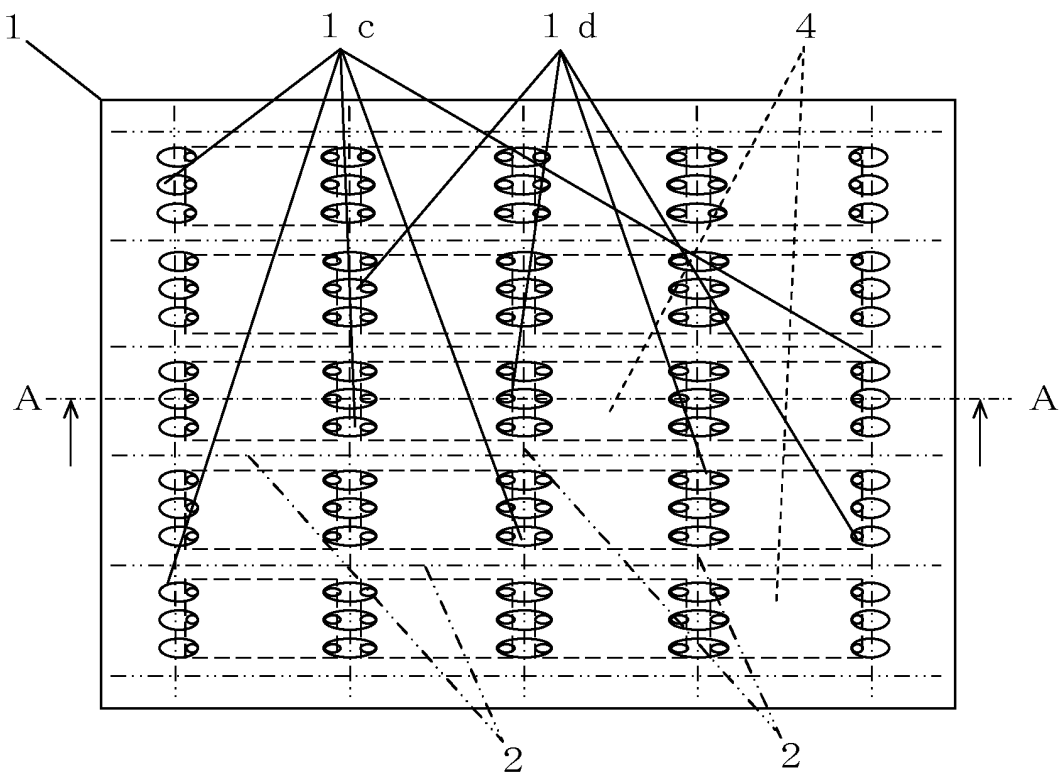
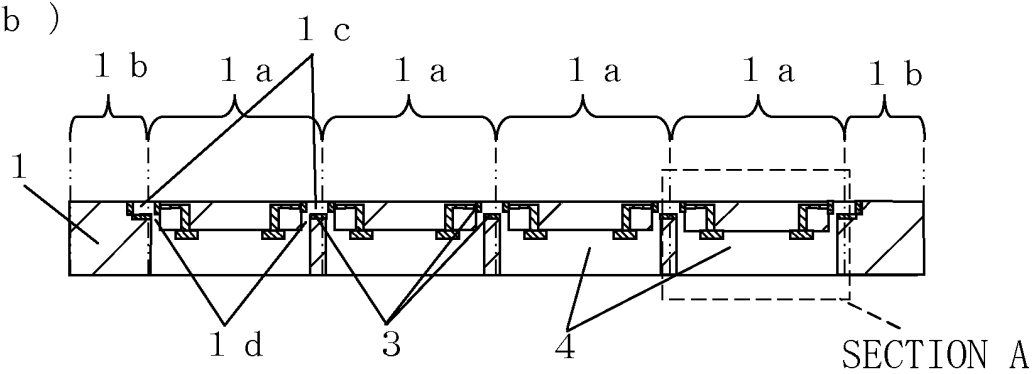


FIG. 3

( a )



( b )



( c )

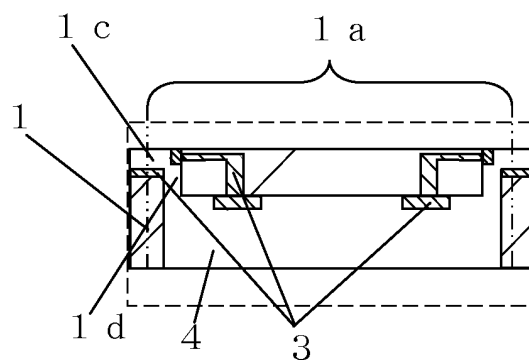
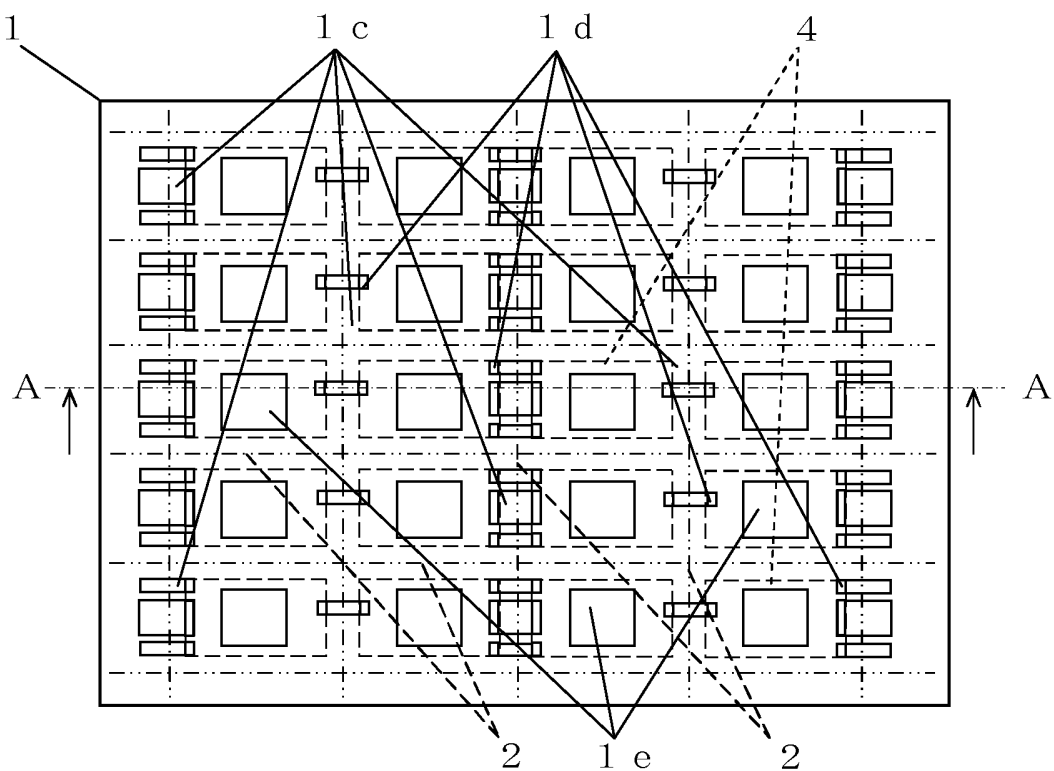
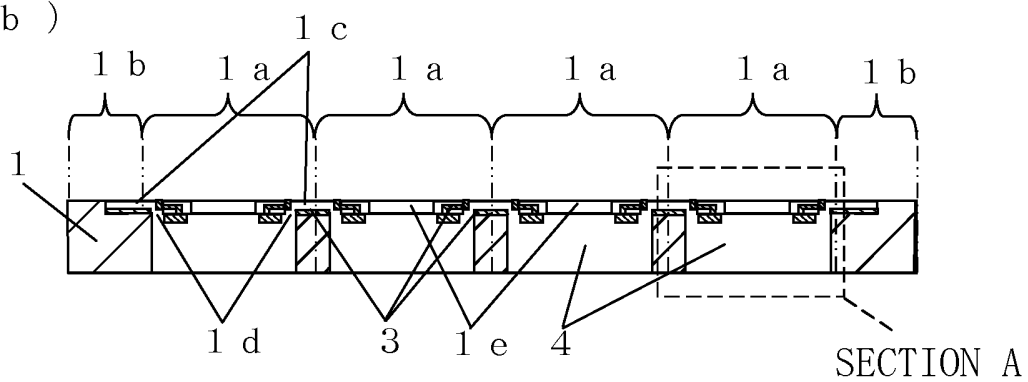


FIG. 4

( a )



( b )



( c )

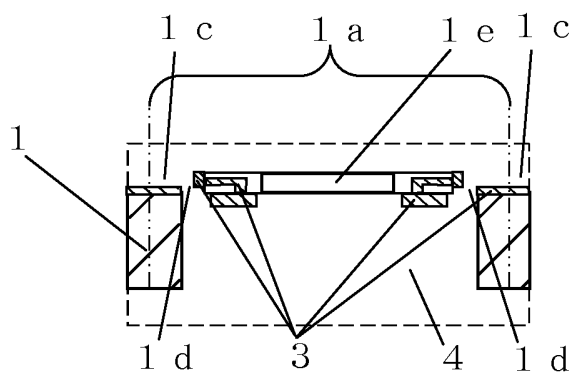
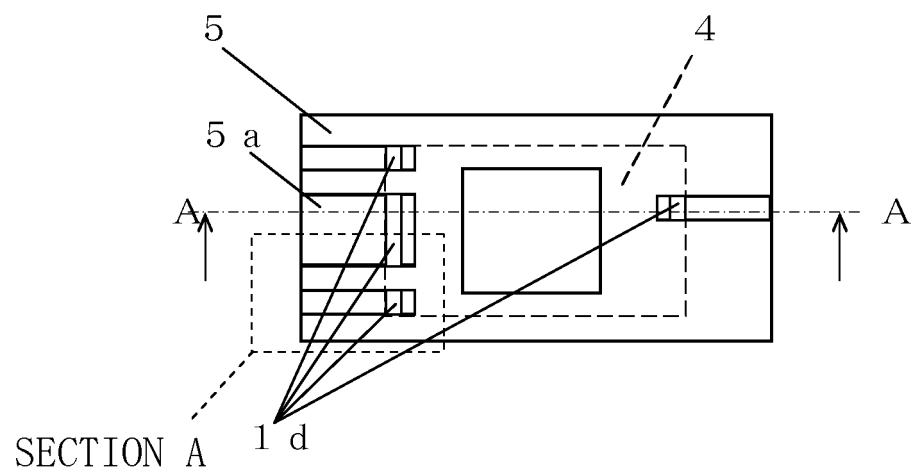


FIG. 5

( a )



( b )

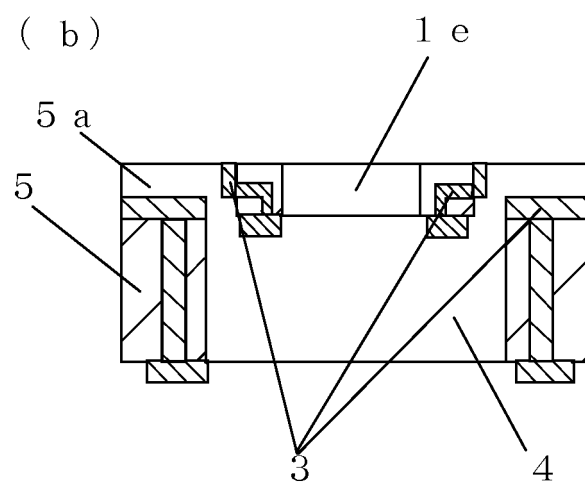
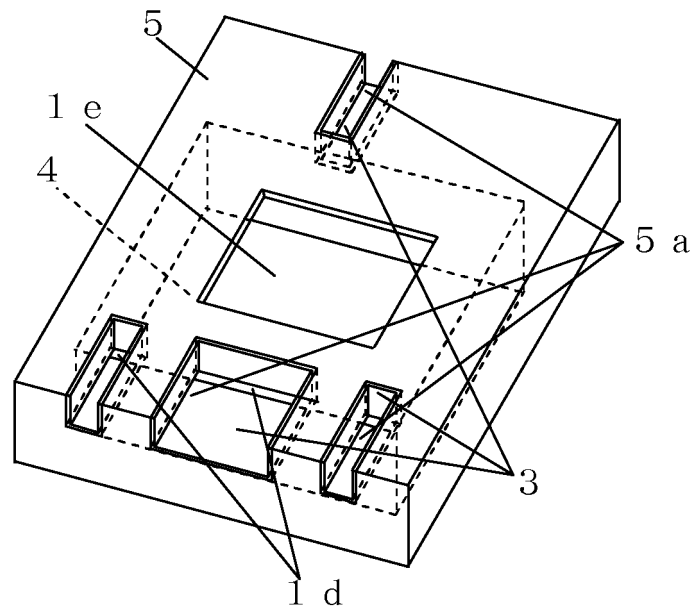


FIG. 6

( a )



( b )

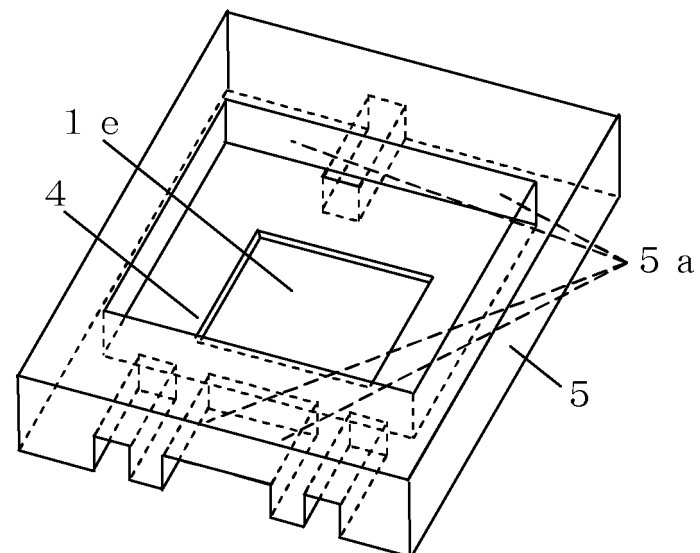
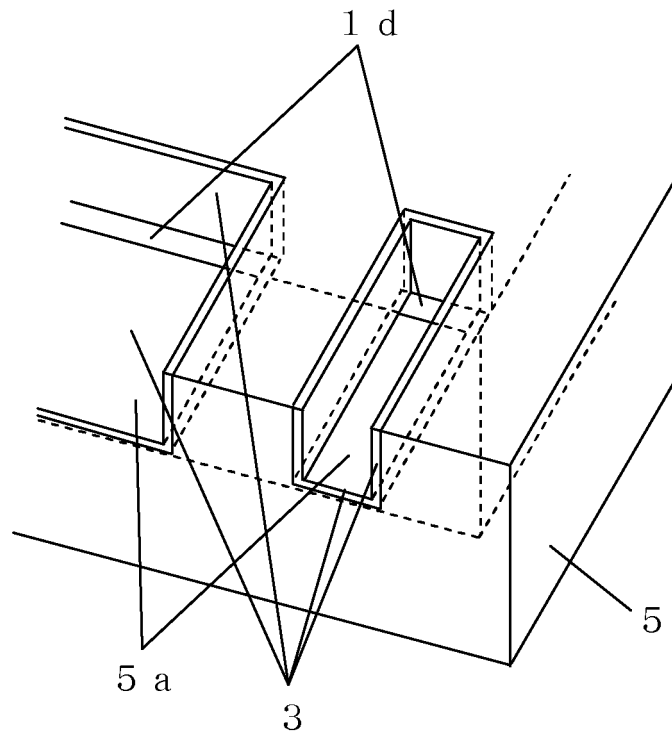


FIG. 7

( a )



( b )

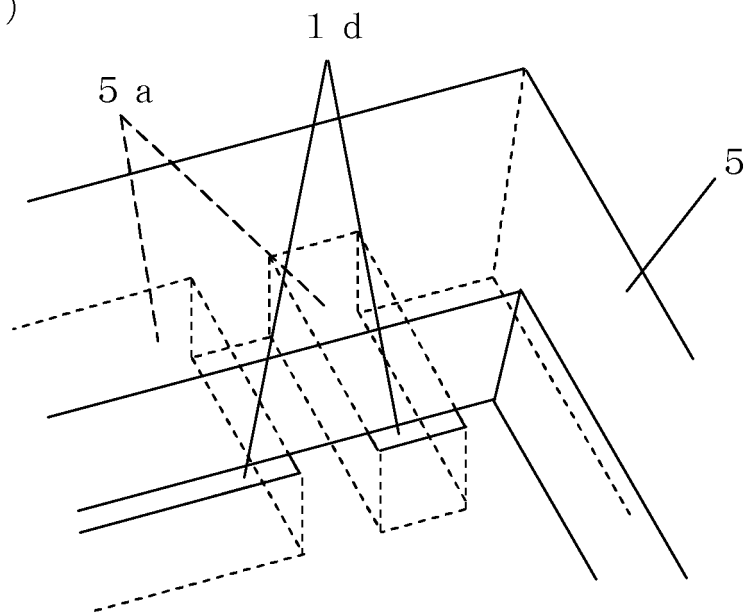
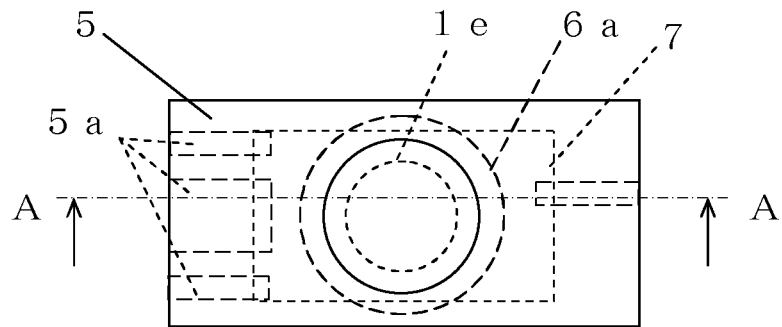
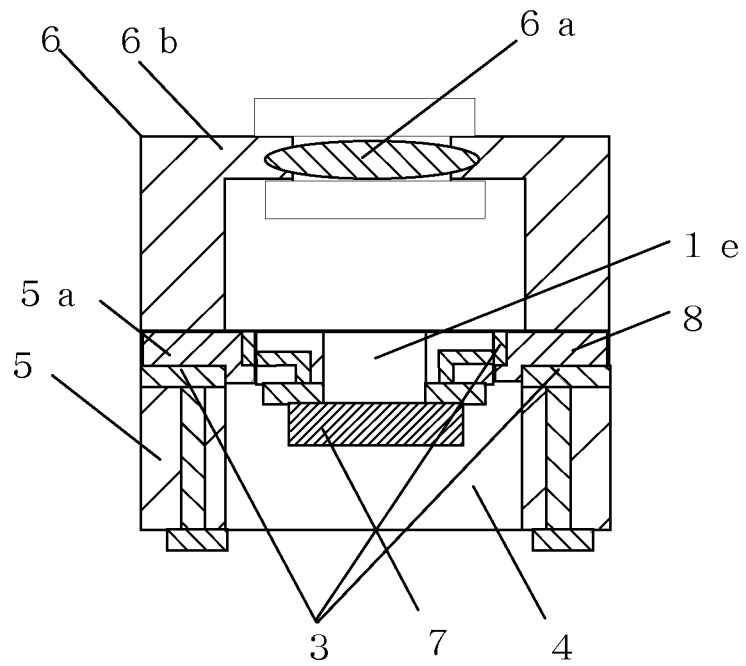


FIG. 8

( a )



( b )



**REFERENCES CITED IN THE DESCRIPTION**

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